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Thermal quench and asymmetric wall force in ITER disruptions[1]

HENRY STRAUSS, HRS Fusion — The thermal quench (TQ) time and asymmetric wall force in disruptions can depend on the resistive wall penetration time τ_{wall}, as shown by simulations with M3D [1]. In ITER, τ_{wall} will be much longer than in present experiments. This might cause the TQ time to be much longer, because parallel thermal transport can be affected by resistive wall tearing modes [2], scaling with a fractional power of τ_{wall}. The asymmetric wall force depends on whether disruptions are cold or hot. In cold disruptions, such as locked mode disruptions, the TQ precedes a vertical displacement event (VDE). In ITER, cold disruptions might produce an asymmetric wall force of only about 5 MN [3]. In hot disruptions, a VDE precedes the TQ. The maximum asymmetric wall force can be quite large [4], but should be small for ITER relevant τ_{wall}.

[1] W. Park et al, Phys. Plasmas 6, 1796 (1999).
[2] J. A. Finn, Phys. Plasmas 2, 3782 (1995)
[3] H. Strauss, Phys. Plasmas 25, 020702 (2018)
[4] H. Strauss et al, Nucl. Fusion 53, 073018 (2013).

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